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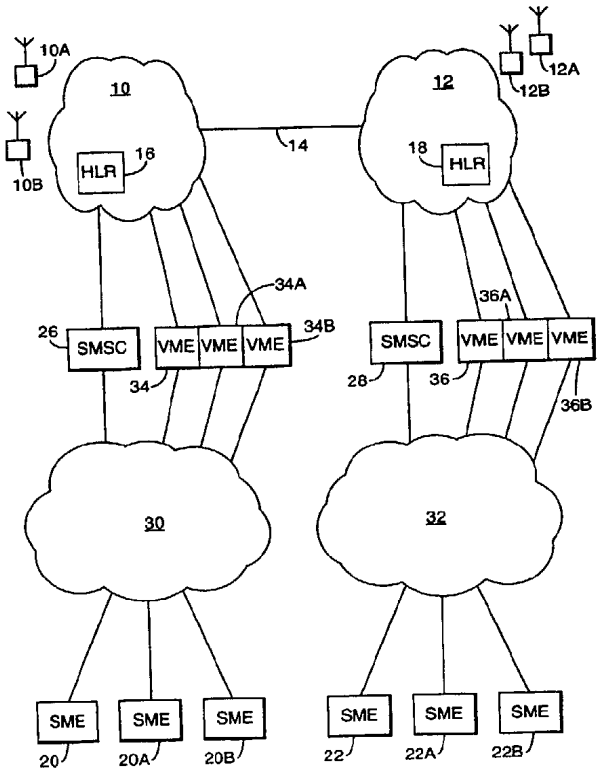
(54) Abstract Title
Transmitting short messages between networks

(57) GSM networks 10,12 are connected by a link 14 and have respective mobiles 10A,10B,12A,12B and respective short message service centres (SMSC) 26,28. Short message entities (SMEs) 20,20A,20B,22,22A,22B are respectively associated with the networks 10,12 and are connected to the respective SMSC 26,28 by fixed networks 30,32. The SMEs may be banking terminals. Short messages originating in either network may be passed first to the SMSC of that network which then transmits them to the appropriate destination address. However, the addresses of SMEs of one network will not be recognised by the SMSC of the other network. To overcome this, a plurality of virtual mobile equipments (VMEs) are provided in association with each SMSC. Each VME has an address of the same format as a mobile address. Short messages from mobiles are easily addressed to a VME of the other network and will be transmitted through the SMSC of the originating network. Each VME then transmits the message directly to a corresponding SME. When an SME originates a message the originator address is changed to that of the corresponding VME.



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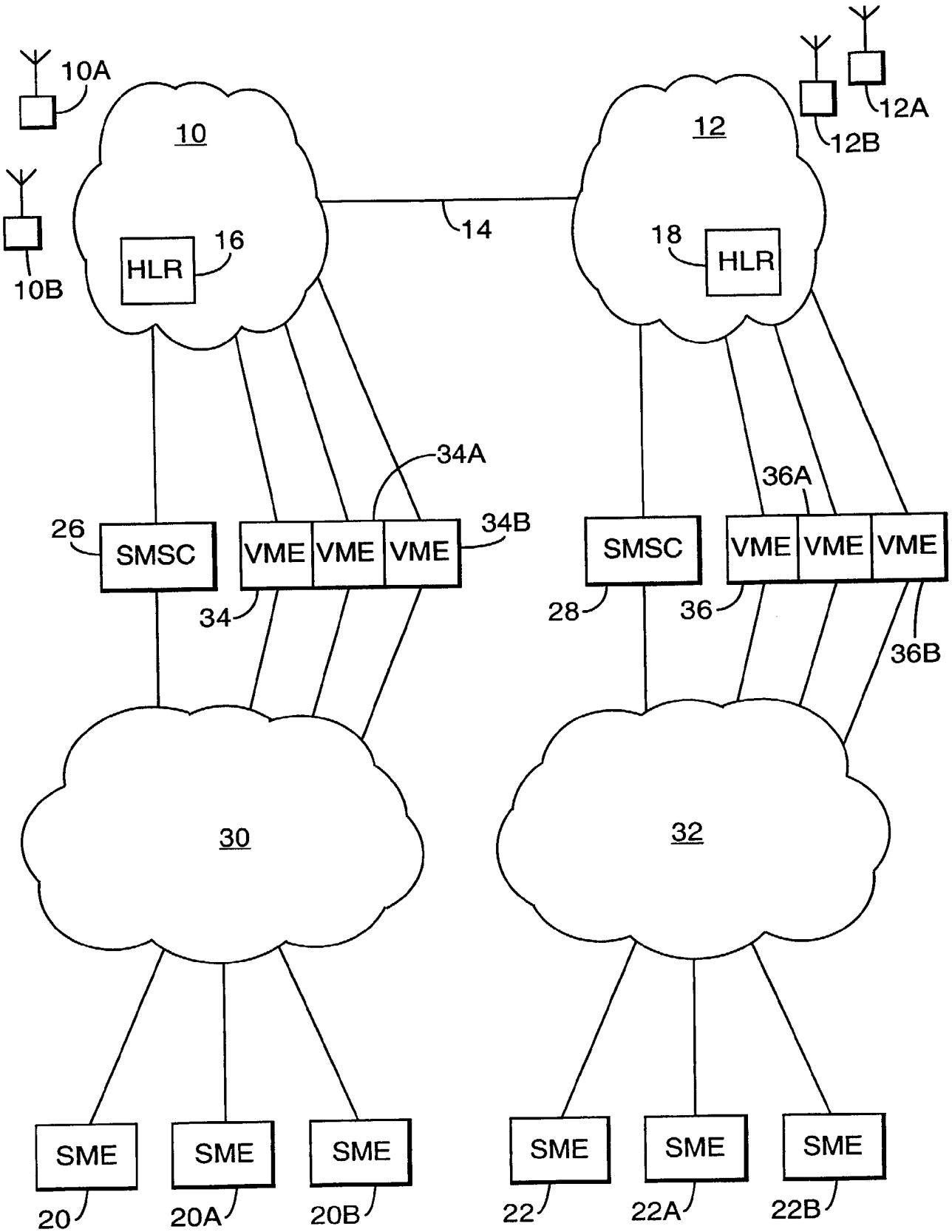
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.


10A
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10B
HLR
16
14
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12A
12B
18
HLR
34A
36A
26
SMSC
VME
VME
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VME
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20A
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SME
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22A
22B

TELECOMMUNICATIONS SYSTEMS

The invention relates to telecommunications systems. Embodiments of the invention to be described in more detail below, by way of example only, are for facilitating the sending and receiving of "short messages" in a telecommunication network such as a GSM network. Short messages are messages of a type defined in the GSM standard specifications and include text messages, binary data messages and other specified types of messages. However, it should be understood that the invention is not limited to the use of short messages in a GSM network. It may be used, for example, for facilitating the sending and receiving of short messages, or their equivalents in UMTS or 3G (Third Generation) telecommunication systems or in GPRS (General Packet Radio Systems). However, it can also be applied to the sending and receiving of messages of predetermined type in other types of radio networks.

According to the invention, there is provided a telecommunications system, comprising first and second radio networks with each of which respective mobile transceivers are associated for originating and receiving messages which comprise at least messages of a predetermined type, each mobile transceiver having an address which is recognisable in both radio networks, respective entities associated with each network for originating and receiving messages of the predetermined type, a respective control means associated with each network for handling messages of the predetermined type originating in that network and for onwardly transmitting such messages to the mobile transceivers in that

or the other network or to a said entity associated with that network according to a destination address of the message, and immediate means associated with at least the first network and having an address recognisable in both of the networks for receiving a message of the predetermined type from the control means of at least the second network and for directly transmitting that message to a corresponding one of the entities associated with the first network.

According to the invention, there is further provided a telecommunications system, comprising home and remote cellular telecommunication networks with an interconnection agreement between them and with each of which respective mobiles are associated for originating and receiving messages including messages of the short message type, each mobile having an address of predetermined format which is recognisable in both networks, a first plurality of short message entities associated with the home network and a respective plurality of short message entities associated with the remote network, each of the short message entities being for originating and receiving short messages and each having an address which is not necessarily of the predetermined format and is recognisable in the network with which it is associated but not necessarily recognisable in the other network, a respective short message service centre associated with each network for handling short messages originating from mobiles associated with that network but not short messages originating from mobiles associated with the other network and for onwardly transmitting such messages to the mobiles in the same or in the other network or to a respective one of the short message entities associated with the same

network according to the destination address of the message, each of the short message entities corresponding to a respective intermediate means which has an address of the predetermined format for receiving short messages from the short message service centre of either of the networks and for directly transmitting that message to the corresponding one of the short message entities.

Telecommunication systems embodying the invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawing which is a block diagram of one of the systems.

The Figure shows a cellular telecommunications system with a home network 10 and a remote network 12. The home network 10 has mobiles 10A,10B (and others not shown) registered with it. The remote network 12 has mobiles 12A,12B (and others not shown) registered with it. It is assumed that the networks 10,12 are GSM networks interconnected in a standard way, using an interconnect 14 (such as an SS7 link, for example) and that an interconnection agreement exists between the networks. Within each network 10,12, the details of the mobiles associated with (or "belonging" to) that network are stored in a respective home location register HLR shown at 16 and 18. When a mobile (e.g. 10A in network 10) wishes to communicate with another mobile or fixed telephone, it will signal accordingly to the base station of the cell of the network where it is situated. The subscriber's details are obtained from the HLR 16 and temporarily placed in a visitor location register (VLR) appropriate to that cell and are then used to

enable the mobile to complete the connection with the called destination. If mobile 10A is temporarily located in network 12, and wishes to communicate with another mobile or fixed telephone, it again signals to the base station of the appropriate cell in network 12. Because of the networks 10,12, network 12 is able to obtain the subscriber's details fron HLR16 in network 10 and temporarily stores those details in the cell (in network 12) where the subscriber is temporarily located to enable the mobile to complete the desired call. In this known way, therefore, mobiles in either of the networks can communicate with other mobiles in the same or the further network or with fixed telephones (or with mobiles in other networks not shown).

The procedure for transmission of "short messages" is different. The term "short messages" as used herein means short messages as defined in the GSM standard specifications. Such messages are commonly in the form of text messages of limited maximum length, but they can have other forms, such as in the form of binary data. As will be explained in more detail below, however, the invention is not limited to the transmission of messages of this "short message" type.

Short messages may be sent to or from mobiles such as the mobiles 10A,10B and the others belonging to the home network 10 and the mobiles 12A,12B and the others belonging to the remote network 12. However, in addition, short messages may be sent to or from "short message entities" (SMEs) such as shown at 20,20A,20B...., and 22,22A,22B.... . These SMEs may be in the form of terminals of various sorts such as

fixed terminals for sending short messages of various types to mobiles and for receiving short messages from mobiles. For example, the SMEs may be in the form of terminals associated with banking computers or computers of other types generating information (commercial information, for example) for transmission to mobiles and for receiving short messages in response from mobiles, but may be of many other types, such as application servers of various types.

Within the GSM system, each network has a respective short message service centre (SMSC) associated with it, such as shown at 26 and 28 respectively. The SME2 20,20A,20B....., 22,22A,22B.... are connected to the respective SMSCs 26,28 by fixed networks 30,32 of suitable type. When a mobile belonging to a particular network wishes to send a short message, it will normally do this via the SMSC of its own network. Thus, for example, if the mobile 10A wishes to send a short message to mobile 10B, the short message is automatically addressed by the mobile 10A to SMSC 26, which then delivers the short message to mobile 10B (after registering the necessary details to enable a charge to be made to mobile 10A). Each short message therefore carries the address of the local SMSC (this address is automatically generated by the sender), together with the address of the intended destination of the short message. When the local SMSC receives the short message, it then reads the address (the MSISDN or Mobile Station ISDN number or telephone number of the intended destination) and despatches the short message accordingly.

The same procedure is followed if mobile 10A in the network 10 wishes to send a short message to mobile 12A in the network 12. Thus, the short message is automatically sent to SMSC 26 which then recognises the destination address as being the address of a mobile registered with the network 12, and the short message will be despatched over the link 14 to the network 12 which will then direct the short message to mobile 12A. Again, the SMSC 26 normally generates a charging record for the short message which will be billed to mobile 10A.

It may be, of course, that the mobile 12A is at this time roaming within network 10. The network 12 will be aware of this, and aware of the current location of mobile 12A, and will despatch the short message back to the network 10 and thence to mobile 12A.

Similarly, if mobile 10A is currently roaming within network 12, and wishes to send a short message to mobile 12A, the short message will still be addressed automatically to SMSC 26 in the network. As before, the SMSC 26 will recognise the destination address of the short message as being for the mobile 12A in the network 12 and will despatch the short message accordingly.

Obviously, the same procedure is followed if a mobile, such as mobile 12A, in the network 12 wishes to send a short message: it will normally only do so by addressing the short message initially to the SMSC 28 associated with the network 12 which will then read the destination address and despatch the short message accordingly.

If a mobile attempts to avoid this procedure, by altering the address of the SMSC to which its short messages are sent, short message delivery may fail. Thus, for example, if mobile 12A is adjusted so that the address of the SMSC to which it sends its short message is SMSC 26 (instead of SMSC 28), SMSC 26 will normally reject the received short message because it will recognise that the IMSI of the originating mobile 12A is an IMSI of a mobile belonging to another network for which it has no subscriber details and for which it cannot originate a charge.

It should be noted here that the term "short message entity" includes any entity capable of receiving and transmitting short messages. The mobiles themselves are therefore also "short message entities". For simplicity, however, the term "short message entity" will be used herein to describe the SMEs 20,20A,20B.... and 22,22A,22B (properly termed "fixed network short message entities") and will not be specifically applied to the mobiles.

So far, the transmission of short messages between mobiles has been described. The transmission of short messages to and from an SME (e.g. 20,20A,20B...22,22A,22B) will now be considered.

If a mobile wishes to send a short message to an SME associated with its own network, this can easily be done. For example, if mobile 10A wishes to send a short message to SME 20, the message is addressed to SMSC 26 by the mobile in the normal way, and the

SMSC will then read the destination address and recognise it as being intended for SME 20, and send it accordingly by the fixed network 30. Similarly, a mobile (such as mobile 12A) registered with the remote network 12 can send a short message to SME 22 by addressing it the SMSC 28 which then reads the destination address, recognises it as being the address of the SME 22 and passes on the message accordingly via the fixed network 32. An SME can send a short message to a mobile or other SME belonging to the same network by addressing the message to its associated SMSC, the message carrying the address (the MSISDN or the mobile or the address, such as the X.25 address, of the other SME).

Problems arise, however, when a mobile belonging to one network wishes to send a short message to an SME associated with another network. This problem arises in part because the various standards relating to GSM operations and to short message services do not extend to SMEs interconnected to SMSCs via fixed networks. Operators of SMEs (such as providing banking or other financial information) may wish to establish their businesses on an international scale. Thus, for example, the operator of SME 20 may wish the SME to be accessible not only from mobiles 10A,10B belonging to the network 10 but also from mobiles 12A,12B associated with the remote network 12 and, of course, other networks not shown. If (for example) mobile 12A attempts to send a short message to SME 20 in accordance with the normal procedure for short messages, it will send the short message initially to SMSC 28. However, SMSC 28 will normally not be able to recognise the address of SME 20 because the address of SME 20 will not be the

standardised form of a normal mobile address (MSISDN). Therefore, the short message cannot be sent in this way. Even if the SMSC 28 can possibly recognise the address of SME20, it will normally not be able to send the message to SME20 because of protocol problems.

Various arrangements are known for attempting to overcome this problem.

One solution is possible for the restricted case where dialogue with a mobile is initiated by an SME itself. Thus, for example, SME 20 can send a short message to a mobile 12A belonging to another network (network 12) by addressing the short message to the remote mobile's MSISDN, the short message being of course sent initially by the SME 20 to SMSC 26 through the fixed network 30 and then via network 10 and the link 14 to network 12. There is no problem about transmission in this direction, because SMSC 26 is able to route short messages to the intended destination. When dialogue is successfully initiated by the SME in this way, a "Reply Path" is automatically set up by the SME in the SMSC 26, soliciting one short message response (only) from the mobile 12A, which passes through the SMSC 26 to the SME 20 without hindrance, because the path has automatically been pre-set and the mobile 12A does not have to know the particular address of the SME 20. However, this is not a solution to the general problem because, by definition, it is only effective when the dialogue is initiated by the SME 20.

Another possible solution, but one which is only possible where the owner of the SME

owns or controls the relevant mobiles, is for the owner to issue all the mobiles with specific SIMs (subscriber identity modules or smart cards) which carry the address of the SMSC which the SME is associated. Thus, if the owner of SME 20 also owns mobiles 12A,12B and others belonging to network 12, it could issue them with specific SIMs which will ensure that the short messages which they initiated will automatically be sent the preferred SMSC (SMSC 26 in this case), and thence to SME 20. Clearly, this solution is only applicable in the restricted circumstances where the owner of SME 20 owns or controls mobiles 12A and 12B.

A further possible solution is for mobiles belonging to one network wishing to send short messages to SMEs associated with another network to alter the stored SMSC address which they hold so that it is the address of the SMSC in the other network instead of being the address of the SMSC of their own network. Thus, for example, if mobile 12A, belonging to remote network 12, wishes to send a short message to SME 20 associated with the network 10, it could change its "normal" SMSC address to be the address of SMSC 26 (instead of the address of SMSC 28). At the same time, of course, it will give the destination address as being the address of SME 20. When SMSC 26 receives the short message from mobile 12A, it will be able to recognise the destination address as being the address of SME 20 and will forward the message accordingly. However, this is in general not a satisfactory solution because the mobile will need to change its stored SMSC address back to the address of SMSC 28 for normal short message service use; changing SMSC addresses is complicated and unsatisfactory. Furthermore, the SMSC

26 will not be able to recognise the MSISDN of mobile 12A and will therefore not be able to carry out a charging function. Such an arrangement is therefore only possible where no charging is contemplated - but such un-charged arrangements produce their own problems of uncontrolled and uncontrollable access and congestion.

In another solution, each SMSC is provided with not one but several different or "virtual" SMSC addresses, and each SMSC address is associated with a particular SME. When a mobile wishes to originate a short message to a particular SME, it addresses the message to the corresponding SMSC address, and the SMSC then directly forwards the short message to the appropriate SME. This solution also, of course, requires the mobile to select an alternative SMSC address - which as explained above, is difficult and generally unsatisfactory. Furthermore, the network operator will in general wish to charge the operator of each SME for all short messages forwarded to it - whereas the owner of each SME will only wish to pay for short messages which it receives from its own registered customers. In order to overcome this problem, it has been proposed to provide the SMSC with customer databases corresponding to each virtual SMSC address. When a short message is received at a particular virtual SMSC address, the SMSC checks the corresponding database to find out whether the short message originates from a genuine customer; if not, the call is blocked. However, the use of these databases is likely to impact on the performance of the SMSC.

The invention aims to avoid these difficulties and, in particular, to avoid the need for a

mobile belonging to one network and wishing to send a short message to an SME associated with another network to address the short message to the SMSC of the other network.

As shown in the Figure, the system provides a "virtual mobile equipment "(VME) 34 which is associated with the SME 22. The VME 34, as its name suggests, is structured to appear to the other network (network 12 and any further network) as an ordinary mobile. In particular, it has a mobile "number", or address, which is an MSISDN and has an associated IMSI. Thus, mobile 12A (for example) in network 12 can send a short message to VME 34 using standard procedure: it sends its short message to its own SMSC 28, whereupon SMSC 28 recognises the MSISDN of the VME 34 as indicating a mobile equipment belonging to the network 10 and despatches the short message accordingly to network 10 via network 12 and the link 14, and thence to VME 34.

VME 34 is directly linked with SME 20. When it receives the short message from mobile 12A (via SMSC 28 as explained), it then passes the short message to SME 20.

There is thus no need for the mobiles to alter the address of the SMSC to which they send their short messages.

When VME 34 learns that the message has been received by SME 20, but not until then, it transmits an appropriate acknowledgement to SMSC 28. If the message is not

successfully received by SME 20, VME 34 transmits a "negative" acknowledgement to SMSC 28, allowing SMSC 28 to carry out the re-try procedure. In this way, the VME enables the system to implement the normal GSM acknowledgement procedure.

As shown in the Figure, there are several VMEs 34,34A,34B,36,36A,36B, each linked to a respective one of the SMEs 20,20A,20B..., 22,22A,22B..., each VME having a different MSISDN. Short messages can thus be addressed to any of the SMEs of network 10 by a mobile in network 12, the mobile simply ensuring that the destination address of the short message is the MSISDN of the appropriate VME in network 10. In each case, the short messages are sent via the SMSC 28 of network 12. Likewise, of course, short messages can be sent by any of the mobiles belonging to network 10, via SMSC 26 and the appropriate VME in network 12.

In practice, the VMEs can be implemented as part of the respective SMSCs 26,28, although they are directly addressable, via network 10 or 12, independently of the address of the respective SMSC. Instead, each could be a stand alone unit or they could be implemented logically as part of a single unit.

The mobile network 10 may wish to levy a charge on the owner of each SME (e.g. SME 20) receiving a short message via the respective VME (VME 34 in this case). However, the owner may only wish to accept (and pay for) short messages from its own known customers. Therefore, each VME advantageously holds a database of the known

customers of the corresponding SME. When a short message is received from a mobile by a VME, the VME can therefore use the database to check that the short message comes from one of its known customer: if it does, it is passed on to the SME but it is rejected otherwise so that no call charge is incurred. The databases can be managed and up-dated by the respective SMEs.

When a VME receives and accepts a short message from a remote mobile and passes it successfully to the relevant SME, it will send an appropriate acknowledgement signal back to the SMSC in the remote network. Thus, if the short message is correctly transferred from a mobile 12A,12B... to the appropriate SME 20,20A,20B....., this will be signalled to SMSC 28. If the VME determines that the originator of the short message for the corresponding SME is not in fact a known customer of that SME, it may signify permanent blockage of the short message to the SMSC 28. If transmission of the short message is not permanently blocked in this way but transmission fails for some temporary reason, this again is signalled to SMSC 28 so that a re-try could be performed by SMSC 28.

When an SME 20,20A,20B... sends a short message to a remote mobile such as mobile 12A, the SME will direct the message to SMSC 26 in the usual way which will then transmit the message to mobile 12A via network 10, link 14 and network 12. During this process, however, the SMSC 26 will replace the originating address of the SME with the address of the corresponding VME. In this way, therefore, it appears to the remote

mobile 12A as if the short message has originated from the corresponding VME. Where the SME wishes to solicit a short message in reply from the mobile 12A, the mobile can thus automatically address the reply to the correct VME and thence to the correct SME. Again, though, the reply which mobile 12A sends to the SME will be sent via SMSC 28 in the remote network. This process of originating address substitution may be performed by elements other than the SMSC, such as by the VME.

The invention has been described above with reference to the transmission and reception of short messages in a GSM telecommunications system. However, it is not limited in this way and may be used for transmitting and receiving messages of particular type in other telecommunications networks, such as UMTS, 3G (Third Generation) and GPRS networks but also including other radio networks not necessarily cellular.

CLAIMS

1. A telecommunications system, comprising first and second radio networks with each of which respective mobile transceivers are associated for originating and receiving messages which comprise at least messages of a predetermined type, each mobile transceiver having an address which is recognisable in both radio networks, respective entities associated with each network for originating and receiving messages of the predetermined type, a respective control means associated with each network for handling messages of the predetermined type originating in that network and for onwardly transmitting such messages to the mobile transceivers in that or the other network or to a said entity associated with that network according to a destination address of the message, and immediate means associated with at least the first network and having an address recognisable in both of the networks for receiving a message of the predetermined type from the control means of at least the second network and for directly transmitting that message to a corresponding one of the entities associated with the first network.

2. A system according to claim 1, in which the messages of the predetermined type are data messages.

3. A system according to claim 2, in which the messages of the predetermined type are text messages.

4. A system according to claim 2, in which the messages of the predetermined type are binary messages.

5. A system according to claim 1, in which the radio networks are cellular networks.

6. A system according to claim 5, in which the radio networks are GSM networks.

7. A system according to claim 5, in which the radio networks are UMTS or 3G (Third Generation) networks.

8. A system according to claim 1, in which the radio networks are GPRS networks.

9. A system according to any preceding claim, in which the mobile transceivers are capable of originating and receiving messages of at least one other type including voice messages.

10. A system according to claim 5, in which the radio networks are GSM cellular telecommunication networks between which an interconnection agreement exists and the messages of the predetermined type are GSM-type short messages, and in which each respective control means is a respective short message service centre (SMSC).

11. A system according to any preceding claim, in which there is a said intermediate

means associated with the second network and having an address recognisable in both the networks for receiving a message of the predetermined type from the control means of at least the first network and for directly transmitting that message to a corresponding one of the entities associated with the second network.

12. A system according to claim 11, in which there is a plurality of the intermediate means associated with the first network and a plurality of the intermediate means associated with the second network, each intermediate means having an address recognisable in both of the networks and being operative to receive a message of the said predetermined type from the control means of either network and to transmit that message to a corresponding one of the entities which is associated with the same network as is that intermediate means.

13. A system according to claim 12, in which each intermediate means is operative to receive a message of the said predetermined type from the control means of either network and to transmit that message to a plurality of corresponding ones of the entities each of which is associated with the same network as is that intermediate means.

14. A system according to any preceding claim, including monitoring means associated with the or with each intermediate means for monitoring messages of the said predetermined type received by the intermediate means and for blocking the direct transmission of certain ones of those messages to the corresponding one of the entities.

15. A system according to claim 14, in which the monitoring means identifies the certain ones of the messages by reference to the addresses of the mobile transceivers from which they originate.

16. A system according to claim 15, in which the monitoring means maintains a database of the addresses of the mobile transceivers from which messages of the said predetermined type received by the intermediate means are permitted to be transmitted to the corresponding one or ones of the entities.

17. A system according to claim 16, in which the database for the or each intermediate means is maintained by the corresponding one or ones of the entities.

18. A system according to any preceding claim, in which each message of the predetermined type has associated with it an originating address for expediting a reply, and including address substitution means operative so that the originating address of each message of the said predetermined type originated by any particular one of the entities corresponds to the address of the intermediate means with which the entity corresponds.

19. A telecommunications system, comprising home and remote cellular telecommunication networks with an interconnection agreement between them and with each of which respective mobiles are associated for originating and receiving messages including messages of the short message type, each mobile having an address of

predetermined format which is recognisable in both networks, a first plurality of short message entities associated with the home network and a respective plurality of short message entities associated with the remote network, each of the short message entities being for originating and receiving short messages and each having an address which is not necessarily of the predetermined format and is recognisable in the network with which it is associated but not necessarily recognisable in the other network, a respective short message service centre associated with each network for handling short messages from mobiles associated with that network but not short messages originating from mobiles associated with the other network and for onwardly transmitting such messages to the mobiles in the same or in the other network or to a respective one of the short message entities associated with the same network according to the destination address of the message, each of the short message entities corresponding to a respective intermediate means which has an address of the predetermined format for receiving short messages from the short message service centre of either of the networks and for directly transmitting that message to the corresponding one of the short message entities.

20. A system according to claim 19, in which the cellular networks are GSM networks.

21. A system according to claim 19, in which the cellular networks are UMTS or 3G (Third Generation) networks.

22. A system according to claim 19, in which the cellular networks are GPRS

networks.

23. A system according to any one of claims 19 to 22, including monitoring means associated with the intermediate means for monitoring short messages received by the intermediate means and for blocking the direct transmission of certain ones of those messages to the corresponding one of the short message entities.

24. A system according to claim 23, in which the monitoring means identifies the certain ones of the messages by reference to the addresses of the mobiles from which they originate.

25. A system according to claim 24, in which the monitoring means maintains a database of the addresses of the mobiles from which short messages received by the intermediate means are permitted to be transmitted to the corresponding one of the short message entities.

26. A system according to claim 25, in which the database for the or each intermediate means is maintained by the corresponding one of the short message entities.

27. A system according to any one of claims 19 to 26, in which each short message has associated with it an originating address for expediting a reply, and including address substitution means operative so that the originating address of each short message

originated by any particular one of the short message entities corresponds to the address of the intermediate means with which that entity corresponds.

28. A telecommunications system, substantially as described with reference to the accompanying drawing.

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Claims searched: All

Examiner: Gareth Griffiths
Date of search: 15 June 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): H4L (LDPC)

Int Cl (Ed.7): H04Q 7/22

Other: Online Databases: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WO99/12364 A2 (NOKIA)	
A	WO98/32300 A2 (ERICSSON)	
A	WO95/12292 A1 (ERICSSON)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.